Analyzing Mother-Infant Interaction During Feeding

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Abstract

Responsive feeding occurs when caregivers respond to infant cues to determine feeding pace and duration. It is hypothesized that responsive feeding supports infant self-regulation and promotes healthy weight outcomes. Previous research suggests that mothers are more responsive to infants' receptiveness than disengagement. This study describes the variability in the cues exhibited by infants during feeding across the first year. 203 mother-infant dyads were assessed when infants were approximately 1, 2, 4, 6, 9, and 12 months of age. Dyads were recorded by video doing a typical bottle-feeding session. Trained coders masked to study hypotheses coded infant satiation cues and the responses from mothers to these cues. In this research, We used clustering methods to explore behavioral patterns by grouping feedings based on recorded baby and mother actions. Furthermore, we explored which behaviors are correlated with each other, and whether clusters and mother-infant interactions develop over time.

Background

- Rapid weight gain during infancy is a strong predictor of weight outcomes later in life
- Responsive feeding is a type of feeding where mothers respond to infant cues that communicate desire to eat to determine pace and duration of the feeding period
- Recent research provides evidence that infants can regulate their own intake in response to changes nutritional composition of formula or complementary foods
- It is important that mothers understand infant communication through feeding cues given that infants are dependent on mothers as caregivers
- Responsive feeding is believed to help infants self-regulate and develop heathier weight outcomes
- Previous research suggests mothers are more responsive to hunger cues, but there is a lack of research on disengagement cues that infants exhibit during the first year

Methods

- 203 mother-infant dyads were assessed at 1, 2, 4, 6, 9, and 12 months of age
- Infants required to be born at 37-42 weeks gestation, have appropriate birth weight, have no perinatal or neonatal complications
- Recorded during a typical bottle-feeding interaction
- Trained coders used a frame-by-frame approach to record disengagement and satiation cues and mother responses
- Coders were masked to the study hypotheses

Results

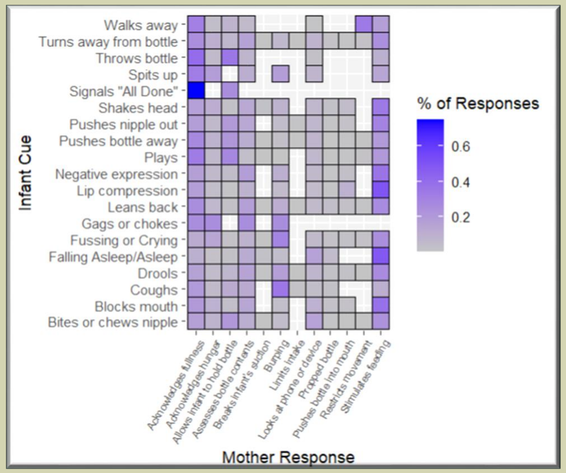

Figure 1: Distribution of mother responses to each infant cue

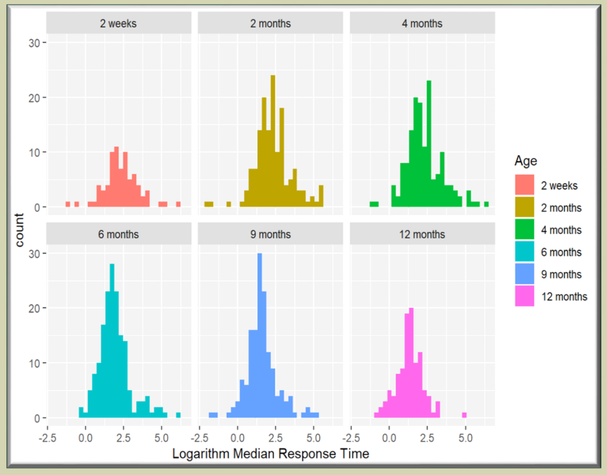

Figure 2: Logarithm mean response times of mothers to infant cues by infant age

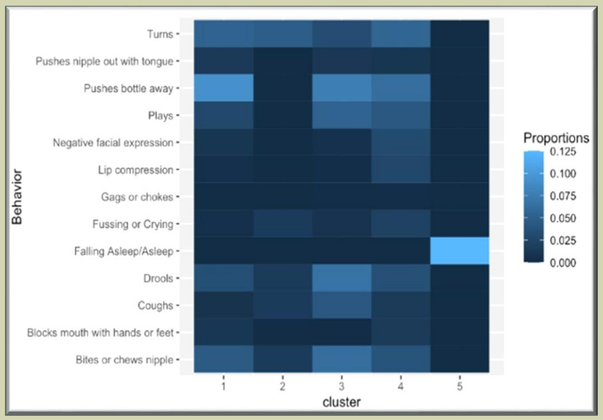

Figure 3: Infant behavior distributions at 2-weeks by cluster

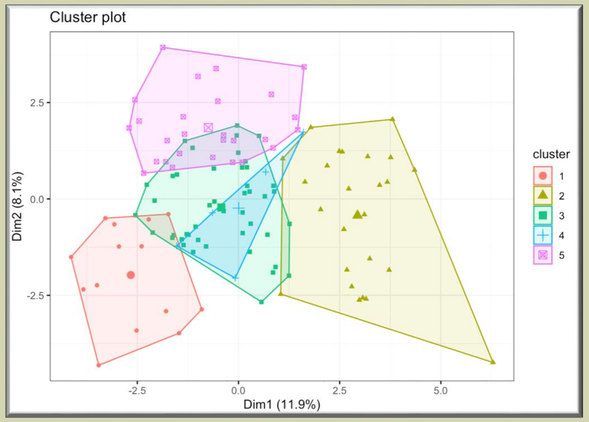

Figure 4: Cluster plot of feedings at 2-weeks

The Model

K-Means Clustering

- Helps us organize and understand large sets of data by grouping similar items together.
- Finds the common patterns or characteristics in data points and grouping them into clusters.
- Each cluster represents data points that share similar features, making it easier to analyze and derive insights from complex data sets.

Our Implementation

- We leveraged k-means clustering to explore behavioral data, highlighting differences and similarities across subjects and different times of their development.
- This approach could help in identifying patterns that are not evident through simple aggregative statistics.
- Our clustering algorithm grouped data into five distinct clusters, each represented by a different color, as displayed in Figure 4.

Future Work

Further investigation can be done with the cluster analysis to determine which behaviors tend to occur closely together in time. Additionally, other correlations with clusters can be explored, such as weight gains and demographic information. Beyond clustering, Hidden Markov Models can help model the evolution of behaviors within feedings.

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